IN THE UNITED STATES DISTRICT COURT FOR THE
NORTHERN DISTRICT OF OKLAHOMA

W. A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA and OKLAHOMA SECRETARY OF THE ENVIRONMENT C. MILES TOLBERT, in his capacity as the TRUSTEE FOR NATURAL RESOURCES FOR THE STATE OF OKLAHOMA,	)
Plaintiff,	)
vs.	) 4:05-CV-00329-TCK-SAJ
TYSON FOODS, INC., et al,	)
Defendants.	)

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VOLUME I OF THE VIDEOTAPED DEPOSITION OF CHARLES COWAN, PhD, produced as a witness on behalf of the Plaintiff in the above styled and numbered cause, taken on the 17th day of February, 2009, in the City of Tulsa, County of Tulsa, State of Oklahoma, before me, Lisa A. Steinmeyer, a Certified Shorthand Reporter, duly certified under and by virtue of the laws of the State of Oklahoma.

A P P E A R A N C E S

FOR THE PLAINTIFFS:	Mr. David Page Attorney at Law 502 West 6th Street Tulsa, OK 74119
FOR TYSON FOODS:	Mr. Gordon Todd Attorney at Law 1501 K Street N.W. Washington, D.C. 20005
FOR CARGILL:	Ms. Theresa Hill Attorney at Law 100 West 5th Street Suite 400 Tulsa, OK 74103 -and- Ms. Melissa Collins Attorney at Law 1700 Lincoln Street Suite 3200 Denver, CO 80203
FOR SIMMONS FOODS:	Mr. Bruce Freeman Attorney at Law One Williams Center Suite 4000 Tulsa, OK 74172
FOR GEORGE'S:	Ms. K. C. Tucker Attorney at Law 221 North College Fayetteville, AR 72701
FOR CAL-MAINE:	Mr. Robert Sanders Attorney at Law 2000 AmSouth Plaza P. O. Box 23059 Jackson, MS 39225 (Via phone)
ALSO PRESENT:	Roger Olsen, PhD

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I N D E X

Q Okay, and can you tell me what the general nature of that litigation is involving?

A Sure. When -- several years ago UPS bought Mailboxes, Etc. Several of the franchisees for Mailboxes, Etc., felt that the purchase wasn't in their best interest, that they weren't being adequately compensated or represented by the new combined entity, and so they are suing for lost profits and lost business opportunities. 09:12AM

Q And that case does not involve environmental matters; correct? 09:12AM

A No, it does not.

Q Have you ever been deposed in a case that involves environmental matters?

A Several times. 09:12AM

Q Okay. Could you identify those for us, please?

A Sure.

Q And when you do that, if you could just tell us the type of environmental issues involved briefly, that would be help -- be helpful. 09:12AM

A Sure. Most of the cases have involved groundwater or airborne contamination around a plant or a -- some other type of facility that had some type of discharge. In those cases, the contaminant 09:13AM

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was typically something like fertilizer that had leached into groundwater, had been spreading over time, and the claims were that the contamination diminished the value of properties that were in the path of the groundwater. 09:13AM

Q And was your role an economic analysis or an environmental analysis in those cases?

A Economic.

Q Have you had any cases where you've actually done an environmental analysis as an expert? 09:13AM

A No.

Q So this is your first case where you've done an environmental statistical analysis as an expert?

A I'm not sure how to understand your question.

Q Well, I just -- you testified that the four or five cases that you've been deposed involving groundwater and airborne contamination, you were doing an economic analysis for the litigants in that case; correct? 09:14AM

A Yes. 09:14AM

Q In this particular case, are you doing an economic analysis?

A No.

Q Okay. Aren't you evaluating statistically the environmental data that's associated with the claims 09:14AM

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in this case?
A No.
Q What are you doing in this case?
A I'm evaluating the quality of the statistical analysis that was done by Dr. Olsen. I'm not doing a separate statistical analysis. 09:14AM
Q Okay.
A And then to answer the first question you asked, in each of those cases, I had to determine what was the environmental impact, what was the spread of the contaminants. Plus, you didn't allow me to finish my description. So in those cases, you couldn't do the economic analysis absent any knowledge of what the environmental contamination was. 09:14AM 09:15AM
Q But in those cases, and I'm just trying to broad brush it. If not, we'll go individually. In those cases, were you personally evaluating the sources of contamination and the scope and extent of the contamination? 09:15AM
A No.
Q So you relied on the statements of other experts and then did your evaluation; correct?
A I did.
Q Okay. So what I'm trying to hone in on here, 09:15AM

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Dr. Cowan, is whether or not this case is the first time that you've actually evaluated the environmental data from a statistical perspective?

A And I just answered that question and said no, it's not. In each of the other cases I had to evaluate the environmental data that I was given and work with hydrologists and experts like that to be able to determine what they were telling me and what their analysis was before I could conduct my analysis. 09:15AM

Q In these previous cases, did you actually critically review the environmental data; that is, did you look at the statistical analysis provided by the experts that were identifying sources in those cases and do a critical review in those cases? 09:16AM

A I did because, otherwise, I couldn't know how valid or reliable my economic analysis was.

Q Okay. Would you tell me about the first case in the most recent past that involved either -- you said there was four or five, so let me go through those. Let's go from the most recent and go backwards. Okay? 09:16AM

A Okay.

Q So what would be the most recent case you've -- involving environmental contamination you've 09:16AM

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worked on?
A There was a case involving Conoco in Pensacola, Florida, where it was Conoco, Agrico and a third company that had gone out of business, so it was primarily Conoco and Agrico. They jointly operated a site which produced fertilizer, among other things, and they -- over time rainwater or rain had caused fertilizer to go into the groundwater and then had spread through the area where -- in Pensacola down into a large bayou, which fronted onto the ocean, but the bayou was important because of all the properties that ringed the bayou having unique values relative to the rest of the city. 09:16AM 09:17AM
Q Okay. In that case did you do a critical or were any of your opinions -- let me strike that. In that case did you offer any opinions as to the source of the contamination? 09:17AM
A Well, that source was a given because of the nature -- 09:18AM
Q So the answer is no?
A -- of the lawsuit. No.
Q Okay, and in that case did you offer any opinions concerning the fate and transport of the contamination that was involved? 09:18AM

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A I did.
Q And what was your opinion involving that case?
A Well, there were actually two analyses done, one for the plaintiffs and one for the defendants.
Q And you were working for who? 09:18AM
A The defendants.
Q Okay, and what was your analysis with regard to fate and transport in that case?
A Well, the problem was that the two analyses were so incredibly different from one another, that 09:18AM
I had to determine what was a reasonable analysis and what was a reasonable analysis on their point that could then be used to determine the likelihood of diminution of value in properties, and so I was
contrasting and working with the two opinions or the 09:19AM
two reports to come to some midpoint.
Q Okay. So you tried to determine what the central tendencies of each of the opinions is so you could come up with a mean or a midpoint between
those two? 09:19AM
A A little broader than that because I needed to know how reliable. It wasn't so much the central tendencies because both reports agreed on that. It was where the edges were.
Q Okay. Did you actually critically review the 09:19AM

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analysis of fate and transport of the fertilizer in the groundwater or were you simply given that as the two different sides, opinions and try to determine what the central tendency -- or excuse me, what the midpoint was between the two? 09:19AM

A I was given the reports and I analyzed those.

Q Okay. So you took the data. You didn't actually express an opinion on whether or not fertilizer actually did move in a certain direction in the groundwater from the plant in question, did you? 09:20AM

A Not in that case.

Q Okay. In front of you -- could you identify what the exhibit in front of you is marked as Cowan Exhibit No. 1 right here? 09:20AM

A That's my rebuttal report.

MR. TODD: Take a minute to just flip through it.

Q Yeah. You might want to take a moment just to make sure because I may characterize something, but I want to make sure that you agree with my characterization. 09:20AM

A Yes, sir.

Q And while you're going through there, what I want you to do is, if you would for me, identify in 09:20AM

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the report any reference you have, maybe in your experience or CV, that discusses the case that you just mentioned.

A Okay. I've read through the report. It is, as nearly as I can tell, my complete report. If you go to Page 71, which is the second to the last page in the report, I list jointly three cases that were property value diminution cases and the last one listed is Bernice Samples versus Conoco, Agrico and Escambia Treating. That was the case we were just discussing. 09:21AM

Q Excuse me a second. It turns out the copy I had in front of me didn't have Pages 71 and 72.

MR. TODD: David, is this an additional copy? 09:22AM

MR. PAGE: Yes, that is. Now this one doesn't have 71 or 72.

Q Could you then direct my attention on 71?

A 71, the third to the last paragraph, toxic tort, the last two full lines -- well, the last three full lines, Bernice Samples versus Conoco, Agrico and Escambia Treating, is the case we were just discussing. 09:22AM

Q So in that case you were offering opinions on diminution in value; correct? 09:22AM

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A Among other things, yes.
Q Well, did you actually testify in court in that case?
A No. Well, there was a deposition. It didn't go to trial. 09:22AM
Q Okay. Is it still pending?
A No. It settled.
Q Okay. Now, the next most recent case, again, involving environmental matters, if you could, identify that for us, please, sir. 09:23AM
A There was a case before that also in Florida that was also a toxic tort case. It was actually quite similar. It also involved Agrico, but it was in Lakeland, Florida and, again, it had to do with fertilizer and contamination of groundwater. 09:23AM
Q And what were your opinions in that case?
A Similar, in that I was looking for diminution in value.
Q Okay. So your primary focus was to evaluate the diminution in value of the property in both of these cases, was it not? 09:23AM
A It was, although I'd like to correct something I said a minute ago. I'd not thought about this, but this will come up in the third case, too. In terms of sources, I was also -- as part of the 09:23AM

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analysis that I conducted, I had to look at sources because in Pensacola, there was a large naval base which was also a source of groundwater contamination.

Q Okay, but did you -- were you the expert that was principally involved with identifying what or which were the sources of contamination in those cases? 09:24AM

A Well, I was one of them in terms of -- my interest and my involvement had to do with the diminution in value as opposed to the environmental -- 09:24AM

Q Right, but if I got a copy of those reports in that case, would it identify an analysis by you of which were the primary sources of the contamination and your basis for that? 09:24AM

A If you mean from an environmental perspective --

Q Yes.

A -- no. From an economic perspective, yes. 09:24AM

Q Okay. So from an environmental perspective, you didn't identify sources in any of these cases; is that correct?

A In the two cases we've discussed so far.

Q Okay, and can you identify this Lakeland, 09:24AM

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Florida case discussion in your Exhibit 1 to this deposition?

A It's also in the same paragraph on Page 71.

Q So you refer to these as toxic tort in your CV; correct? 09:25AM

A Yes, sir.

Q Okay. The next case, sir?

A It goes --

Q My count it's the third case.

A Mine, too. 09:25AM

Q Good.

A Excuse me. I'm thinking about timing so I can get this chronologically.

Q If you don't get it perfect, that's okay.

A Okay. Thank you. Because there are two cases 09:25AM at about the same time but they were quite different from one another. The -- excuse me. They're in St. Petersburg, Florida, Pinellas County. There was a phosphorus plant owned by a company called Stouffer, spelled like the food company. This was a class 09:25AM action against Stouffer because Stouffer had purchased the phosphorus company, and under Florida state law they had purchased it for the purpose of cleaning it up, and then they were going to resell it, but their primary mission in life was to 09:26AM

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remediate environmental properties.

During the cleanup of the phosphorus, the phosphorus exploded and there was a huge cloud of phosphorus in the air. It -- there was airborne contamination, and the question was both -- well, primarily diminution in value for the properties that were around this phosphorus plant. 09:26AM

Q And was that the primary focus of your opinion in those two cases, the diminution in value of the property? 09:26AM

A Okay, but we're up to three.

Q Oh, I'm sorry. You said there were two similar. So we're only talking about one now.

A Oh. Just the phosphorus case, yes.

Q Okay. So St. Petersburg, Florida was the third case? 09:27AM

A Yes, sir.

Q Was a phosphorus plant where the purchaser was to remediate the facility; correct?

A Yes. 09:27AM

Q And there was an explosion?

A Right.

Q In that case was your primary focus of your opinion the diminution of value of the properties surrounding the plant? 09:27AM

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A Yes, sir.
Q Okay. Did you do any evaluation as to the scope and extent, that is, were you primarily responsible for the evaluation and scope and extent of the contamination that was involved in that case? 09:27AM
A No.
Q What's -- is that one -- is that particular case identified in your CV, sir?
A That's the third one listed under the heading toxic tort. 09:27AM
Q Thank you, sir. Okay. Can we go to No. 4, please?
A Sure. In Scottsdale, Arizona, there was a plant -- this was a long time ago, so I don't think this is a secret anymore. Motorola has a plant 09:28AM where it produces circuit boards, and for the circuit boards -- once the circuit boards are etched, they're cleaned with a chemical solution, and the chemical solution ran into the groundwater. The plant had been in operation for 40 years. 09:28AM
Q Do you know what chemical solution was involved?
A I don't remember off the top of my head.
Q That was the principal contaminant?
A Yes. 09:28AM

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Q You don't recall what the contaminant was?
A Well, we're talking about fifteen years ago.
Q Okay.
A So if I were allowed to go back and look at my records, I would, but I don't. 09:28AM
Q I'm just checking --
A Okay.
Q -- what you understood today. So you -- the issue was the groundwater contamination of some cleaning elements for the circuit boards at the 09:28AM Motorola plant?
A Yes.
Q Okay.
A And then the EPA one day decided that that chemical was a -- the chemical in the cleaning 09:28AM solution was a carcinogen, and so there were the beginnings of a class action suit being filed against Motorola for contaminating the groundwater, and I was asked to determine the likelihood of -- the likelihood and number of people who were exposed 09:29AM from a medical perspective to this carcinogen and what would be the likely outcomes.
Q Okay. So you -- would you characterize your analysis as epidemiological in that particular case or how -- what would you characterize that? 09:29AM

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A It was a combination of epidemiology and demography.
Q Demography, okay. Did any of your work in that case or, excuse me, your opinions in that case involve determination of scope and extent of these cleaning solvents in the environment? 09:29AM
A I don't know what you mean by scope, but certainly the extent.
Q Okay, but you didn't do that yourself; you relied on other experts to tell you how far the expanse was of the contaminants in the groundwater; is that not correct? 09:30AM
A Well, I worked with them, yes, but I relied -- I relied on the work that they did. I worked with them as they were beginning to get into this. 09:30AM
Q But you weren't the one that modeled, for example, the cleaning solvents in the groundwater; correct; you didn't do that analysis?
A Well, I'm having trouble responding to your question because if you're talking about modeling of the cleaning solvents in the water, no. If you're talking about the extent of the dilution and how far out it spread, yes. 09:30AM
Q You did the calculations on the dilution?
A I worked with the hydrologists on it. 09:30AM

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Q Okay. Were you -- did you give an opinion on the solution, or did the hydrologists provide the opinion on the dilution of these contaminants in the groundwater?

A I gave a slightly different opinion in terms of the impact of the solution after I relied on it from the -- 09:30AM

Q Right?

A Okay.

Q Okay. And that analysis provided or is that case discussed in your CV that's in Exhibit No. 1? 09:31AM

A No.

Q Why not?

A It never got far enough that the -- that it was filed. There was just initial discussions about it. So I was hired to do the epidemiological work. 09:31AM

Q So that was your primary focus was epidemiology in that case?

A Well, that and the demography. You couldn't -- the two different -- it's two different bags of tools. 09:31AM

Q When you say demography, you're talking about the characteristics of the populations of individuals or people in the area?

A Yes, sir. 09:31AM

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Q Thank you. Now, did you give your deposition in that fourth case from Scottsdale, Arizona?
A No, I did not.
Q Okay. In these first four cases we've discussed, did you provide a written report? 09:31AM
A Yes.
Q Do you still have those written reports?
A I'm not sure about the Pensacola case, and the other three, no.
Q Okay. Would you have any objections to 09:32AM checking and providing those to your counsel so you could provide me copies of any reports you still have available?
A I'd be happy to.
MR. PAGE: I'd like to make that request. 09:32AM
MR. TODD: Sure. I'd just ask that you put it in writing after the deposition.
MR. PAGE: You bet.
MR. TODD: We'll be happy to look into that. 09:32AM
MR. PAGE: You bet.
Q On the other three cases, on the Conoco case I think you mentioned it was fertilizer. What were the chemicals of concern in the first case we talked about, the one that's just recently? 09:32AM

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A The Pensacola case, that's the most recent case.
Q Yes, sir. What did I say? Did I say Agrico? Excuse me.
A No. That's okay.
Q Conoco and the Pensacola, yes, sir.
A Right. Okay. Well, there was -- this is one of the reasons why there was some source confusion in this case. The primary concern about the fertilizer was ammonia. However, the problem in the groundwater contamination that was discovered after you got up to the bayou was uranium, which is -- as far as we could tell wasn't part of the production process for Conoco or Agrico. 09:33AM
Q So when you did your evaluation of diminution of value, which chemical were you considering? 09:33AM
A Well, as an economist, you wouldn't consider one specific chemical. You would consider their cumulative effect.
Q Okay.
A And what impact they had on the values of the properties.
Q So you were acting as an economist in that case?
A Yes. 09:34AM

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Q Okay, and on the Agrico-Lakeland case, that was I think the second one we talked about?
A Yes, sir.
Q What were the chemicals of concern in that case? 09:34AM
A Same issue because it's fertilizer. So, again, the primary one I remember is ammonia, but there was no uranium involved in that one.
Q Okay, and what about the St. Petersburg, Florida plant; what were the chemicals of concern 09:34AM involved in that case?
A Well, since it was a phosphorus plant, phosphorus.
Q It was phosphorus, okay. And was there any residual phosphorus in the environment that you 09:34AM evaluated or was it simply the effects of the initial explosion that you were concerned with in that case?
A I don't know how to answer your question because are you talking about residual phosphorus as 09:34AM phosphorus or are you talking about residual phosphorus after it's combined with something else?
Q Yeah, after it's combined, the results of the combustion.
A Okay. That's good because if it hadn't 09:35AM

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combined, it would still explode.
Q Yeah, well, it wouldn't be in the environment naturally, would it be, phosphorus?
A No, because if it --
Q If it's exposed to air, it immediately combusts; correct? 09:35AM
A Yes.
Q Okay. So what were the chemicals of concern after the explosion in the St. Petersburg, Florida plant? 09:35AM
A I don't recall.
Q Okay, and Scottsdale, you just remember it was a cleaning agent; you don't recall what it was?
A No. In both of these cases we're talking fifteen years ago, so -- 09:35AM
Q And you also -- okay, and there was a fifth case you said that involved some environmental contamination involvement.
A This was a case involving a dry cleaner and the remediation of or the -- how -- it's not a single shop. It's a large chain of dry cleaners and how they dealt with the requirements to take care of the discharge from dry cleaning. 09:35AM
Q Okay, and do you remember the location where this case occurred? 09:36AM

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A Florida.
Q Florida, okay. And what was your role in that case, sir?
A I was supposed to determine whether or not the cleaner had been deceptive in the way that they worked with both the State and with their consumers. So it was a deceptive sales practices case in terms of how they worked with the State and the consumer in the way they dealt with the contaminants that would result from dry cleaning. 09:36AM
Q Okay. Did your work in that case involve an evaluation of the scope and extent of contamination?
A No.
Q Do you recall where the contamination was in that case? 09:36AM
A Well, what I said was --
Q It was more a record keeping kind of a case; is that what it was?
A It was more of a record keeping case because it was every dry cleaner for this large corporation, 09:37AM but we're talking about hundreds of locations.
Q So your evaluation was more of a records analysis to see if they properly reported their disposal or management of their cleaning fluids?
A No. It was actually how they dealt with the 09:37AM

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State in terms of the reporting to the State about the costs for remediation, what they had done to adhere to state law and then how they dealt with that in their pricing for consumers.

Q But was it mostly evaluation of their records -- of what they told the State through their records? 09:37AM

A Well, told the State and then told consumers also. So there was two different sides to this.

Q But just to make sure, it did not involve an evaluation of the contamination at these particular dry cleaning locations? 09:37AM

A No.

Q Any other cases involving environmental matters? 09:37AM

A Not that I recall.

Q Okay, and the fifth case we just talked about, is that reported in your CV, sir?

A I believe it is.

Q Can you show me where? 09:38AM

A Yes, sir. Page 70.

Q Under deceptive sales practices?

A Yes, sir, the second one, Watkins versus Dry Cleaners International.

Q Looking through your CV, I just don't sense 09:38AM

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that there's a lot of experience you have working with contaminants in the environment. Is that a fair characterization?

MS. HILL: Object to form.

A Of course, that wasn't why I was hired, so -- 09:38AM

Q Can you answer the question yes or no?

A No, there's not a lot of experience dealing with the determination of environmental contaminants and their sources.

Q Other than the description of these five cases that you just provided us, can you tell me if you have any other experience, whether it's involved in a case or not, not necessarily litigation -- I'm trying to look at experience beyond litigation -- where you've done evaluation of datasets that involve geochemical or environmental data? 09:38AM 09:39AM

A If you -- are you using the -- I understand the geochemical. Are you using environmental in the narrow sense of relating to how it affects the earth as opposed to environmental in terms of sociological concerns? 09:39AM

Q Yes, sir.

A Okay. Then, no, I have not had any other involvement.

Q Okay. So this would be your first case where 09:39AM

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you evaluated such a dataset as in this case?
A Well, keep in mind, I didn't evaluate the dataset. I evaluated Dr. Olsen's work.
Q Well, you did, though, did you not, comment on whether or not Dr. Olsen's dataset was reproducible; correct? 09:39AM
A Yes, I did.
Q Okay. So I guess let me restate the question this way: Is this the first time -- I hope there's no underlying -- I'm trying to make this as simple as possible. Is this the first dataset that you've evaluated that deals with environmental data defining environmental data the way you just did? 09:40AM
A Okay. Well, I want to be able to distinguish between evaluating the data itself, which I didn't look at, versus evaluating Dr. Olsen's data because he constructed his datasets from that original dataset. 09:40AM
Q Okay. Let me ask you this question then. Maybe this is a better question. Is this the first case where you've done a review of statistical analysis of how another expert did statistical analysis on an environmental dataset? 09:40AM
A Yes, it is.
Q Thank you. I knew if I got enough tries, I 09:40AM

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could ask a good question --

A Thank you, sir.

Q -- that got to the point. If you bear with me here today --

A And I appreciate it. 09:41AM

Q Thank you. Have you ever -- I assume this is the case. Have you ever done any microbial source tracking work?

A Well, I'm not exactly sure how to answer that question only because I'm not sure how you 09:41AM characterize the work I did. So if I could describe a case that involved microbial source tracking, I worked on a case involving barges on the Mississippi River.

Q Yes, sir. 09:41AM

A And the question was whether or not the materials used to coat the interior of the barges' holds were adequate to keep bacteria from eating into the hulls of the boats. So what happened was that there were a series of experts pulled together, 09:42AM some who were microbiologists, some who were geochemists, some who were engineers, and each person was involved in some aspect of collecting and organizing data on what the coatings were in the barges on the Mississippi, how intact were they, the 09:42AM

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conditions within the holds and finally the extent of pitting that had been in the barges, pitting being sort of eating away of the interior of the hull.

My job was to coordinate the job of everybody else and then analyze the data they collected. So I helped with the front end in terms of thinking about how one goes about collecting the data and what was a representative sample. I worked with -- 09:43AM

Q So that was -- so in that case, was the issue the source of bacteria that was intruding into containers on a ship? 09:43AM

A Yes, sir.

Q Okay.

A Okay. 09:43AM

Q So that was the -- the bacteria you're looking at to see whether or not there was bacteria on a ship getting into containers that were being transported by that ship; correct?

A Well, not necessarily because the question -- part of the question was what had the barge owners done that would encourage the growth of bacteria, and so there's -- so there are a lot of different sources of bacteria, and the question was whether or not they had done a sufficient amount to protect the 09:43AM 09:44AM

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interior of the boat over and above the covering as opposed to the invasion, and then the question -- the secondary question was, did it matter what part of the Mississippi, did it matter whether it was saltwater or not, did it matter what the boats were hauling, did it matter what the configuration of the boats were. So there were a lot of other factors that went into -- 09:44AM

Q Is that the only experience you've had with bacteria source tracking? 09:44AM

A Oh, no.

Q Have you ever worked in a case where there's bacteria source tracking in the ambient environment, such as the issues involved in this case?

A Actually I'm working on a project that's not a case, but I'm working on two projects right now that involve the spread of different types of diseases. One is in Lima, Peru, where I'm working to study the spread of multidrug resistant tuberculosis throughout the population in Lima that would be sourced at prisons, and then the prison structure in Lima is quite a bit different than it is here so that you have -- 09:45AM

Q So you're looking at whether or not there is contaminated food and contaminated -- 09:45AM

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A No.
Q Well, so is that -- is it concern about bacteria in a prison; is that what the concern is?
A No. The concern is the bacteria and how it spreads through the population outside of the prison. 09:45AM
Q But it's people -- that people spread --
A Could you not interrupt me, please?
Q Excuse me.
A And I apologize. I don't mean to be harsh, but it's just difficult for me to get my answer out. 09:45AM
Q That's fair enough, and I'll try not to do that.
A Thank you. Yeah, the problem is families and the family structures and then the extended family structures and then how they all interrelate so that you've got multiple pathways by which tuberculosis and other related diseases can be spread. 09:45AM
Q Okay.
A The other work I'm doing is for the CDC and for the Bill Gates Foundation in Africa, where I've designed a research study to look at the spread of AIDS from mother to newborn and how interventions, different interventions can effectively stop that spread from mother to newborn depending on the types 09:46AM

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of drugs that are used, the care that the mother gets before the birth, the -- whether or not there is -- the mother breast feeds the baby, all the different sources of or the transmittal channels where a newborn can get AIDS from its mother, and in that case, I'm working with a team of pediatricians, oncologists and a variety of other doctors, but I was brought on board because they needed a statistician to coordinate the project. 09:47AM

Q And sometimes I interrupt, Dr. Cowan, because I'm thinking maybe we didn't communicate initially. 09:47AM

A Yes, sir.

Q I think my original question was, have you done any studies in the ambient environment? Do you understand what an ambient environment means? 09:47AM

A Could you define it for me?

Q Well, that would be outside, for example, in the fields and forests of the IRW, the Illinois River watershed.

MS. HILL: Object to the form. 09:47AM

Q That's what I mean by ambient environment.

A Well, I'm sorry. I have trouble distinguishing that between being in a city or a rural environment where -- I mean, I'm dealing with an entire country, like Zambia, where some people 09:47AM

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live in the city, some people live outside, but I would consider everybody to be in an ambient environment if they're giving birth.

Q But those issues you are dealing with there, both in Africa and in Peru, isn't the focus person-to-person spreading of the disease? 09:48AM

A Well, it may or may not be depending on, first of all, the disease because tuberculosis --

Q Well, yes or no?

A Okay.

Q Is the answer then no?

A Well, I was trying to give you an answer that indicated that there is no yes or no.

Q Okay. Were those two studies primarily epidemiological studies; would you characterize them as that? 09:48AM

A I'm going to fall back to the answer I gave before on the other studies. It's a combination of epidemiology and demography.

Q Okay. Did you read Dr. Harwood's report in this case? 09:48AM

A Yes.

Q Okay. Would you -- what I'm trying to understand is if you ever reviewed any source tracking evaluation such as Dr. Harwood did in this 09:48AM

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incorporated in NWIS web. This is May 2003.
Q Okay, and when you look at, for example, on Page 2 of the exhibit, can you identify, sir, in what sense the USGS documents using the word parameter? 09:57AM
A They are using it to describe variables.
Q Using it to describe variables?
A Yes.
Q And that's exactly how Dr. Olsen used the term; correct? 09:57AM
A Well, not exactly because here the word variable isn't appearing anywhere. So apparently USGS calls them parameters, but they don't use both terms.
Q Okay. Well, Dr. Olsen used variable 09:57AM parenthetically to make sure there was an understanding that, in at least the scientific community for environmental scientists, parameters and variables mean the same thing; correct?
MS. COLLINS: Object to form. 09:58AM
A Well, I understand that that's your allegation. I don't know what was in Dr. Olsen's mind.
Q Well, isn't that also how USGS is using that term? 09:58AM

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A Not on this page.
Q You just testified that USGS is using the term as you would use the word variable; correct?
MR. TODD: Object to form.
A Okay. You're asking me something slightly different. I just indicated a minute ago that they used the word parameter to substitute for variables. 09:58AM
Q So do you believe that USGS is likely using the word parameter in the same way that Dr. Olsen uses the word parameter in his report? 09:58AM
A It's possible.
Q I have a question. Would you turn to Paragraph 3 of your report, sir?
A Okay. I'm sorry. Do you want me to keep this or would you like me to give it to -- 09:59AM
Q We can just set it right here in front of you.
A Yes, sir.
Q And then sometimes we go back to previous exhibits.
A Okay, and I'm sorry, where would you like me to turn now? 09:59AM
Q Paragraph 3.
A Okay, sir.
Q Would you read Paragraph 3 for me, please?
A I'm sorry. I'm not there yet. 09:59AM

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A No, sir.
Q Have you ever used principal component analysis in your professional work?
A Yes, sir.
Q Could you explain to me in general terms the applications in which you've used principal component analysis? 10:38AM
A Sure. Do you want a short list or the full list?
Q Could you kind of categorize how you used it? 10:38AM
A Sure. Remember earlier we were talking about my graduate students?
Q Yes.
A My most recent graduate student is using principal components analysis on a survey conducted in Honduras to look at -- she's conducting a behavioral analysis to determine whether she can find ways to help workers stem the flow of multidrug resistant Tuberculosis in the Honduras. 10:38AM
Q I'm going to apologize for interrupting. 10:39AM
A You bet.
Q But can you tell me applications where you used PCA in your own work, not maybe working with someone else? For example, have you done any studies yourself where you've used principal 10:39AM

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component analysis?

A Okay. Just to conclude what I was saying, however, I will say that I consider that my own work. I'm advising a doctoral student, but if you're asking me if I've done the work as opposed to working with somebody else, actually the very first work that I did was for the National Science Foundation doing an analysis of economic data for a country to determine sort of sources and flows of income and how the economy within that country operated, somewhat like the structure of our own national income accounts. 10:39AM 10:40AM

Since then I've used principal components, for example, in a -- in studies of samples of people to determine whether or not you could use principal components and its adverse Mahalanobis distances for sampling purposes for construction of samples using controlled selection. I've used it in a financial context where we've looked at, for example, stock data. You've got lots of different types of stocks, and the question is if you are trying to invest in stocks, how do you classify them together or apart and is there a more efficient way to classify stocks relative to other methods of creating equity within a firm? Those types of analyses are to determine 10:40AM 10:40AM 10:41AM

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the structure of financial markets. So a lot of different applications.

Q So has your work in the -- with PCA been primarily involving studies within the social sciences? 10:41AM

A Yes.

Q Okay. Have you ever done any work with PCA in the non-social sciences?

A That seems so harsh. We could call them less social. 10:41AM

Q How would you call it?

A I understand what you meant. What are commonly referred to as the hard sciences.

Q Yes, sir.

A Well, only in the sense of deal with it from, 10:42AM you know, pure mathematical, which really isn't the social sciences, but if you're talking about like physics, chemistry and so on, no.

Q Or geochemistry?

A No. 10:42AM

Q What about samples involving environmental contaminants?

A Could you be a little bit more explicit?

Q Well, like in this case where Dr. Olsen was reviewing samples of -- environmental samples and 10:42AM

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testing it for different parameters, geochemical parameters; correct?

A Uh-huh.

Q Have you done any kind of PC analysis with a dataset similar to Dr. Olsen's? 10:42AM

A No.

Q Have you published any peer-reviewed articles concerning principal component analysis, whether it's the social or hard sciences?

A Well, there was a report to the National Science Foundation. So they published it, I didn't publish it, although that was a really long time ago, and then there are two papers in my resumT that are -- describe the use of Mahalanobis distances, which is the adverse of principal components, for essentially attempting to do controlled selection -- use of controlled selection methods in sample surveys. 10:42AM 10:43AM

Q And what kind of survey was involved; was it a social sciences survey? 10:43AM

A No. This was for the Bureau of the Census. So it would be in general any of the surveys that they do.

Q People population surveys?

A No, sir. At least half or more of the work 10:43AM

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A Well, you asked me if I had to study the use of PCA in environmental cases, and I took your have to meaning it was an absolute must to be able to understand PCA. PCA is a common technique that's been used for a very long time, and I've used it throughout my career. So if you're asking me if I had to study PCA, no.

Q Okay. Let me ask you this then: Would you agree that the application of PCA to environmental sciences is somewhat different than when you apply it to the work you've done in the social sciences? 10:45AM

A No.

Q You say it's the same methodology?

A Well, mathematically, the mathematics aren't going to change. 10:45AM

Q You don't think there's any unique attributes of doing work in environmental science data that would be important for you to appreciate prior to evaluating Dr. Olsen's work in this case?

A Well, let me put it in perspective. What Dr. Olsen did was he did his analysis using a program called SysStat, which is one of the programs we use, and SysStat doesn't ask if it's environmental. It just runs the program. 10:46AM

Q Okay, and you're --

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A So the mathematic -- I apologize because I interrupted you, but just I wanted to conclude by saying the mathematics are exactly the same.

Q Okay, but in your use of PCA, isn't it important to have an understanding of the types of data that are involved in the PCA analysis in order to interpret that data? 10:46AM

A Well, that's why we reconstructed all of Dr. Olsen's datasets.

Q But did you come to an evaluation and understanding of the type of data that was involved? 10:46AM

A Well, I came to some understanding of the type of data. I'm not putting forth -- myself forth as a chemist, a biologist or anything else, but, you know, when I work with doctors and I design research for them, I'm not putting myself forth as a physician, but that doesn't mean that my work isn't, you know, valuable in terms of understanding the transmission of diseases. 10:46AM

Q Did you do any additional study of PCA applications in environmental forensics prior to doing your work in this case? 10:47AM

A I did.

Q And what did you do?

A Well, I'm sorry. I'd like to amend just the 10:47AM

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word prior. I did it concurrently.
Q Okay, and what did you do?
A Well, I -- first, I read Dr. Johnson's chapter in the book that he published. I also read a text book by a Professor Jeliffe, J-E-L-I-F-F-E I 10:47AM
believe, that has a couple of chapters on use of PCA in environmental work. I looked at other articles that had been referenced that use PCA in environmental work, and I believe that there's an example also given in geology, another of the hard 10:48AM
sciences, not in Harmon's textbook but in a third textbook I have and, I'm sorry, I can't remember the name of that one.
Q And why did you do that review and evaluation?
A Just to understand what other -- to put the 10:48AM
analysis in context and understand what was commonly done in that field as opposed to my field.
Q Did you find that to be important in review of PCA analysis?
A No, sir. 10:48AM
Q So you don't think it was important to know what the common practices are, for example, in the environmental science field as opposed to your field in order to understand whether the environmental scientists properly employed PCA? 10:48AM

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A From a mathematical perspective, what I found in reviewing -- you asked me if it was important. The reason it wasn't important was because I didn't learn anything new in reading those articles or the journals or the books that I didn't already know in terms of the mathematical application. So it couldn't be important if I wasn't learning something new or different. There wasn't anything different.

Q Do you have any experience prior to this case in transforming environmental sampling data? 10:49AM

A Remember the barge case we were discussing before?

Q Okay.

A I had to do transformations on that data and deal with some of -- well, I had to do transformations on that data. 10:49AM

Q What kind of transformations did you use?

A Some cases logarithmic and other cases calculation of logistic values, which is -- uses a log but there's a further set of transformations involved. 10:50AM

Q Was it a Log10 transformation?

A I believe it was, yes.

Q Okay, and why did you do the transformation in that particular case? 10:50AM

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expansive to cover whatever it was.
Q What about the second type of discussions where you talked about overlaps; did he make any changes in his reports based on these overlap discussions you just testified to? 11:34AM
A No, sir, because when we discussed it, we discussed that although we were overlapping, that it was probably just fine, that redundancy in some cases is a good thing.
Q Did you make any alterations to your report based on any of your discussions with Dr. Johnson? 11:34AM
A The only -- I didn't really make changes. I acquired a better understanding from Dr. Johnson about the multiplicity of tests that could be performed and one -- what non-detect levels -- or what non-detect levels I would likely see. So I gained a better understanding of non-detect levels from speaking with Dr. Johnson. 11:34AM
Q Did you not understand what a non-detect meant in -- 11:34AM
A Oh, no.
Q -- environmental data before your discussions with Dr. Johnson?
A I apologize for interrupting you. No. I understood perfectly what a non-detect was because 11:35AM

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we see that frequently in biostatistics, too. What I wanted to know about was the specific tests and what a non-detect level would be for different tests of the same analyte.

Q Okay, and did you -- what did you learn new from Dr. Johnson in your discussion on non-detects? 11:35AM

A That there were different levels of precision for different types of tests for the same analyte, and that sometimes there was a preferred test and sometimes there wasn't. 11:35AM

Q I think we're going to come back to that subject in a minute, but before we go there, could you summarize for me today what your opinions are that are contained in your report?

A Certainly. May I refer to my report? 11:35AM

Q Yes, sir.

A Thank you.

Q What I'm trying to do is understand what your key opinions are in the case.

A Okay. I realize there was one other change that I made to the report after speaking with Dr. Johnson, and that was simply that I expanded the section that I had on strength of relationship. 11:36AM

Q Can you be a little more specific what you mean by strength of relationship? 11:37AM

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dealing with standardized data, in which case it is the mean.

Q If you are looking for loadings, though, aren't you trying to determine whether or not that particular analyte has a particular impact on that sample, so zero represents a no impact for the sample; correct? 12:00PM

MR. TODD: Object to form.

A Well, it sort of depends on when and where you're substituting to zero. It was -- we were just talking a minute ago, it depends on whether or not it's a standardized value. It depends on whether the analyte is important or not important on that particular principal component. I mean, there are all sort of other factors that you'd have to consider before you decide whether or not zero is important or not. 12:00PM

Q We'll come back to that.

A Okay.

Q Are there anything else -- is there anything else that you would add to this list of key criticisms you have in Dr. Olsen's report? 12:00PM

A Let's continue. Okay. On Page 26, I have a brief discussion of the non-detects.

Q Uh-huh. 12:01PM

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A And I'm going to come back to this later, but the problem with the non-detects is that because non-detect limits differed even for the same analyte because of different test readings. That adds variability to the dataset. That wasn't accounted for.

Q So you suggest here on Page 26 that non-detects should be treated as zero?

A Well, that wouldn't be possible.

Q Well, you say rather than treat this as zero non-detect, Dr. Olsen substitute the midpoint between zero and the detect limit for the chemical; correct? 12:01PM

A That's what I say.

Q So what is your criticism? 12:02PM

A Well, my criticism is that it's not that there is a systematic -- it's not that there is a value substituted for the non-detect; it's that the values vary for even the same analytes. So I give an example, I believe, for aluminum where you've got different non-detect limits, and if there wasn't -- this wouldn't be an issue if the log transforms weren't taken, but once you take the logarithms, those numbers blow up into very large numbers. 12:02PM

Q Okay. What else? 12:02PM

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having first been duly sworn to testify the truth, the whole truth and nothing but the truth, testified as follows:

CONTINUED DIRECT EXAMINATION

BY MR. PAGE: 08:33AM

Q Good morning, Mr. Cowan. I'd like to remind you you are still under oath today to tell the truth and the whole truth.

A Thank you. Good morning, Mr. Page.

Q Yesterday we spent some time talking about substitution of mean values and data. Do you recall that discussion? 08:33AM

A Yes, sir.

Q And was it -- would I be summarizing your testimony correctly by saying that you believe that SysStat automatically substitutes the means of a variable for a missing data or the empty cell when you select pairwise deletion? 08:33AM

MR. TODD: Object to the form.

A That's actually not what I said. What I said was, the effect of what SysStat does is like what you just said but, in fact, what's happening is that since the means are all zero because we're dealing with a correlation matrix, so the data is all standardized, that the fact that whether you did it 08:33AM 08:34AM

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by substituting the means, which is what you just described, or whether you just do the calculation on the data where you have observations on both variables, the effect is the same because if you were to substitutes the means, you would just be adding the zeros and so it wouldn't change the numerators or the denominators in terms of its values. 08:34AM

Q But it's your -- I'm sorry. Excuse me.

A Well, the only thing I wanted to add is, there's only one slight difference and that has to do with the denominators and the ratios that we discussed yesterday, which are the sample sizes. 08:34AM

Q Okay. Let me make sure I understand what you're saying. Are you suggesting that SysStat actually plugs in a zero for that missing data and then does the correlation on that analyte for that sample where there's missing data? 08:34AM

A No, sir. What I said was the effect of the way they do the calculation is the same as if you did that, but I'm not saying that SysStat does that because it would be highly inefficient computationally. What SysStat does is it only uses the observations for which it has values on both variables, but if you were to continue down -- you 08:35AM 08:35AM

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have two columns of numbers. If you were to continue down those columns and wherever you have a missing value, you plugged in the mean, which is zero, and then summed those values, you'd still come to the same summation. 08:35AM

Q I just want to make sure we're speaking the same language here. Last night I was able to get some materials from the SysStat operating manual, and I want to show those to you and discuss them.

A Okay.

Q Here is Exhibit No. 22. Have you ever reviewed the SysStat operating manual?

MR. TODD: May I interrupt for just a second? We promised Melissa we'd give a little description of the exhibits. 08:36AM

MR. PAGE: Thank you. I'll do my best.

MR. TODD: Thanks.

Q This is a three-page exhibit that was taken from the SysStat operating manual, and it's labeled Cowan Deposition Exhibit No. 22. Do you agree with my description there, Dr. Cowan? 08:36AM

A Yes, I do.

Q Okay, and if you look at the second page, it refers to deletion methods. Do you agree with that?

A Yes. 08:36AM

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Q Okay. Would you read the first paragraph under deletion methods on the second page?

A The two most common deletion methods are listwise and pairwise deletion. In listwise deletion the analysis used complete cases only. That is, the procedure removes from computations any observation with a value missing on any variable included in the analysis.

Q Okay. Let's focus on the first sentence. I want to make sure we're speaking the same language, Doctor. It talks about listwise and pairwise deletion, and do you agree that Dr. Olsen implemented pairwise deletion when he ran SysStat with the missing values?

A Well, since I don't have his code, the exact code that he ran, I don't know that 100 percent, but it appears to me that he ran that option as opposed to listwise.

Q Did you testify yesterday -- I just want to confirm this -- that you were able to exactly reproduces Dr. Olsen's results by running a pairwise deletion by SysStat?

MR. TODD: Object to form.

A No, that's not what I said. That was actually in the document that you showed me from Dr. Murphy.

What I said was that I was able to exactly reproduce his results by plugging in the means.

Q And you plugged in the means. What do you mean by that?

A I sub -- any time I had a missing value, I substituted the mean value. 08:38AM

Q Of all the non-missing variables, you meaned those, so you got the average of that variable where you had data available for the other observations?

A Yes. Your first second -- your first sentence wasn't quite accurate, but your second sentence was exactly correct. 08:38AM

Q Okay. So you found that by -- you actually ran the database by substituting the mean values for the missing data; correct? 08:38AM

A Yes, sir.

Q Did you ever run the database without doing that by just doing pairwise deletions?

A I did once.

Q And did they -- were they -- is it your testimony, sir, that those two results, that is, when you substituted the mean value and when you ran pairwise deletion, were exactly the same? 08:38AM

A Well, remember, we talked about within decimal places. 08:39AM

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Q Yes.
A Like within -- out to the fourth decimal place, so you wouldn't really observe a difference.
Q Okay. Now, what is listwise deletion? Is that not where if you're missing a value or variable or sometimes we call it parameter for a particular observation or a sample, then the SysStat program completely eliminates that sample or that observation when it runs its correlations; correct? 08:39AM
MR. TODD: Object to form. 08:39AM
A Well, it doesn't eliminate it. It's still in the database. It just doesn't use it in the calculation.
Q Thank you.
A Okay. 08:39AM
Q That clarification, thank you, and with pairwise deletion, what it does is, it does not run a correlation for any analyte or for any analyte within an observation where there is a blank cell or it's missing data; is that correct? 08:40AM
A No, sir. You -- not the way you described it. What it does is, it does a calculation for each pair of variables, but it does a separate calculation for each pair of variables using only those observations where you have -- only -- yes, only those 08:40AM

observations where you have both values present.
Q So I was correct in my statement?
A No. The way you described it, the -- you can't do that on a computer. So the way I described it is the way that the calculation is actually done. 08:40AM
Q Well, let's continue on here. So the second sentence on the paragraph -- the first paragraph is -- states that that the procedure removes from computations any observation with a value missing on any variable included in the analysis. Doesn't that 08:40AM indicate, sir, that if you have a missing data piece on a variable, it simply does not run a correlation for that variable from that observation?
MR. TODD: Object to form.
A The reason I'm having trouble with your 08:41AM wording is that running the correlation is done on all the observations. What I believe you mean is that it's not including in the calculation of the correlation any pair that's missing the cell value on one variable or the other. 08:41AM
Q Okay. So let me see if I can get an example where we might have a meeting of minds here. If there are -- say there's 74 observations.
A Yes, sir.
Q And 71 of them have complete observations but 08:41AM

three of them do not.
A Yes, sir.
Q Okay. So that when you run the correlations on the analyte for the 71 that have the missing data, you're really going to have an end of 71 for 08:42AM
that analysis; is that correct?
A That is correct check that.
Q Would you show me in here -- no. Let me strike that. So yesterday when you testified that
-- and I believe you testified to this and, of 08:42AM
course, the Record will reflect if I'm wrong -- that the SysStat program automatically substituted the mean values, what you're saying today is, is that it doesn't automatically substitute the mean values, but if you did the computations, the results would 08:42AM
be the same?
MR. TODD: Object to form.
A Actually what I believe I said was that the effect of that calculation is the same.
Q Did you say you confirmed these results by 08:43AM
using SSOE program?
A I said SPSS. SSOE, I have no idea.
Q I'm working with an engineering firm called SSOE, and I confused the terms. SPSS?
A Yes, sir, and I understand the confusion on 08:43AM

acronyms.
Q Are you telling me today you confirmed that with the SSOE -- SS -- I should get it in front of me then I won't forget.
A That's okay.
Q SPSS?
A Thank you. Yes, sir, I did.
Q Okay, and did you get the exact same results as when you ran pairwise deletion or SysStat without substituting the mean values? 08:43AM
MR. TODD: Object to form.
A I'm not sure I did that calculation using both systems. What I did was I ran the SPSS results on the original results that Dr. Olsen got in SysStat and I reran it in SPSS. 08:44AM
Q Okay. When you compared Dr. Olsen's results from SysStat when you employed pairwise deletion --
A Yes.
Q -- and compared that to SPSS, were they the same results? 08:44AM
A And that's what I was saying yesterday. They're the same out to the fourth decimal place, and you would expect, since you have two different programs and different two operating systems, that there be would a little fuzz out there on the edges. 08:44AM

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Q And is it your understanding, sir, that SPSS has a pairwise deletion function that operates in the same way as the SysStat pairwise deletion function?

A Yes, sir. 08:44AM

Q In your report when you state, I think at several occasions, that Dr. Olsen substituted mean values, would it be more precise to say that you believe that Dr. Olsen's methodology in SysStat had the effect of substituting mean values? 08:45AM

A Well, I wouldn't use the word methodology, but the remainder of your statement is correct, that it's the effect of using that default, which has the same effect as substituting the means.

Q But -- but Dr. Olsen employed -- rather than actually doing what you did, which was I guess to take the means of the data and then plug them in to those parameters -- excuse me, to those observations for the missing parameters -- 08:45AM

A Yes, sir. 08:45AM

Q -- he simply loaded those observations with the missing data in to SysStat and selected pairwise deletion and let the program come to the results; is that correct?

MR. TODD: Can I interrupt for a second? 08:46AM

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Are you posing this as a hypothetical as to what Dr. Olsen did?

MR. PAGE: That's a question; that's a question.

MR. TODD: Okay, and you're testifying as to what Dr. Olsen did here? 08:46AM

Q Well, I thought we've already established that you believe that Dr. Olsen used pairwise deletion, that you ran it. Am I mistaken on that?

A No. I said that I was able to replicate his results, and so he could have gotten those results doing either of the procedures. 08:46AM

Q That's if you're correct in saying that the mean values do actually create -- if you substitute the mean values, you actually get the same results as pairwise deletion; correct? 08:46AM

A If --

Q If that's true?

A If that's true?

Q Yes. 08:46AM

A Then, yes.

Q So are you testifying you really don't know what Dr. Olsen ran when he ran SysStat?

A No. What I'm testifying is that it doesn't matter because mathematically, they're identical. 08:46AM

Q Well, answer the question, though, please, sir. Do you know -- can you testify today whether Dr. Olsen substituted mean values or ran pairwise deletion when he ran his PCA with data that had missing variables? 08:47AM

A No, because Dr. Olsen didn't provide any of the summary documentation that tells me how he ran his programs.

Q So let me go back to my original question then before the objection. So what you're stating today 08:47AM is that you don't know how Dr. Olsen ran his PCA with the missing observations?

A Yes, that's what I'm saying.

Q So on Page 23, for example, of your report --

A Yes, sir. 08:48AM

Q -- Paragraph 54, would you turn to that, please?

A Sure. Paragraph 23?

Q Yes, sir.

A I'm sorry, Page 23, Paragraph 54? I messed 08:48AM up.

Q I did, too, by saying yes, sir. It's Paragraph 54, Page 23.

A Yes, sir.

Q Second sentence, when you say when he is 08:48AM

Q Are you telling me and this court that what I just said and what I said in layman's term is different than our definition of sensitivity and specificity?

A Okay. Well, what I understood you to say was that she was trying to determine the presence or absence of the biomarker in poultry litter, let's say, and what I'm saying is that that's not what this paragraph is talking about. This is a jargon paragraph that talks about the statistical properties of the test being conducted but not the statistical outcomes. 11:31AM

Q I see. So you're looking at a specific paragraph of Dr. Harwood's report that you think that she's talking about statistical analysis? 11:31AM

A Well, since that's what she's doing and since that's how she uses the terms as she goes forward, yes.

Q I want to make sure I understand your testimony from yesterday with regard to your experience with bacteria. 11:31AM

A Yes.

Q Am I correct in remembering that the only study, investigation you've worked on with regard to bacteria was the one involving the bacteria on the 11:32AM

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ship?
A Yes.
Q And am I also correct in remembering that in that work that you did on bacteria on the ship, it did not involve bacteria originating from either human or animal feces? 11:32AM
A I'm sorry, I was listening to the question but I got lost in the middle, so could we just repeat the question?
Q Absolutely. 11:32AM
(Whereupon, the court reporter read back the previous question.)
A Oh, no, that's not true. That was considered as a source and, in fact, in the waste products found in the hollows in the barges, the -- I don't know how to describe them but they're what keep the barges afloat, so they're supposed to be completely empty and dry. They frequently found both human feces and then feces that had come in through water that had come over the side of the barge and into the hollows, and there were very specific tests for the presence of feces, fecal coliform, all that good stuff. 11:32AM 11:33AM
Q So that you found from the ambient ocean waters bacteria that got in, I guess, what, the 11:33AM

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bilge waters of the ship?
A Yes, except the Mississippi River so it --
Q Mississippi River?
A Yes.
Q Fresh waters had bacteria in them? 11:33AM
A Yes.
Q And they identified those as both animal and human originating bacteria?
MR. TODD: Object to form.
A Well, I'm not sure they identified them as 11:33AM animal or human, but it was quite obvious in some cases it was human.
Q Okay, and so how did you draw the conclusion that in some cases they were animal manures?
A I didn't, and there wasn't a specific test for 11:34AM that, but I'm just pointing out the fact that since water is flowing over the sides of the ship, I don't know how animal manure would be kept out separately from -- and you'd only have human.
Q Is it your understanding -- what tests did you 11:34AM run; what bacterial tests did you run?
A I don't know. I didn't run the tests.
Q So you wouldn't be able to tell us anything about how you identified bacteria from humans or not humans; correct? 11:34AM

Q Can you tell us how many different farms these samples originated from?
A I don't recall that either, but I'm -- I know it's got to be less than or equal to ten.
Q That -- your math has served you well, sir. 11:44AM
A Thank you.
Q Wouldn't that type of information be important for your understanding of your opinions in this case with Dr. Harwood, the number of samples of poultry farms, how many were positive and whether they were 11:45AM different farms or the same farm?
MR. TODD: Object to form.
A No, sir.
Q Why not?
A Okay. First of all, if I gave you everything 11:45AM that you could possibly hope for, that it was ten independent completely unrelated farms, so that would eliminate clustering, okay, and then on top of that you told me that all ten of them showed that there was a biomarker, okay? That tells me 11:45AM virtually nothing about what is actually happening in the population because I don't know from a sample of size ten whether that really means it's 100 percent or some significantly lower number with any confidence because of the nature of the sampling. 11:46AM

Q What do you mean by that, the nature of the sampling?
A Okay. If, for example, the presence or absence of a biomarker was -- let's say that a biomarker was present 80 percent of the time, it would be highly likely to take a sample of ten and have all ten of them show the presence of the biomarker even though only 80 percent of the poultry had the biomarker in it, and that's actually true for 80 down to 70 down to 60, and we could calculate -- 11:46AM
Q But -- I understand. What is it about the sampling that makes you draw the conclusion?
A It's just the nature of sampling theory.
Q It's just like a theoretical basis that any number of samples, only 80 percent of them will probably actually be representative of what you actually identified from your analysis? 11:47AM
A Well, actually from sampling theory, you can calculate the likelihood of seeing any particular outcome for any level of presence of biomarker. So we could sit down and do that calculation if you like. 11:47AM
Q So how many samples would you have recommended to Dr. Harwood that you take?

A It would depend on --
Q Of the poultry litter?
A Of the poultry litter, and I understood that. I would only need to actually know one thing from Dr. Harwood, which is what level of presence are you measuring against. So in other words, if she gave me a defining cutoff and said I'd like to know that more than 65 percent or more than 80 percent of the poultry contained this biomarker, then I could tell her what size sample to select, but I need to know that number. 11:47AM 11:48AM
Q So a size sample of -- in your sampling theory example, a sample size of ten would result in what under your sampling theory presence?
A Well, that's the problem. A sample of size ten would mean that it could be anywhere -- I could observe that they all have the biomarker, but I still don't know that I necessarily have a presence that's higher than 80 percent. 11:48AM
Q So that would -- if you have a sample of ten, you can only, under your sampling theory, assume a presence of 80 percent; is that what you're telling us? 11:48AM
MR. TODD: Object to form.
A Well, I'm using 80 percent as a hypothetical. 11:48AM

Q I was asking you what -- not using a hypothetical, tell us what the results are for a sample size of ten.
A Oh, I'd have to sit down and do the calculations, but it's a pretty straightforward calculation. 11:49AM
Q And I assume we don't have the right calculator here with us today either?
A Nope. I do.
Q You want to do the quick calculation on that, please? 11:49AM
A Yeah. I'll warn you, it will take me about ten minutes. If you'd like me to do it during the break --
Q Would you mind doing it during the lunch hour? 11:49AM
A No. I'd be happy to.
Q Thank you. You didn't provide that information in your report somewhere, did you?
A Actually I addressed that issue and the other issue about the presence or absence of the biomarker in species that aren't poultry in paragraphs -- 11:49AM
Q I'm talking about the issue we were just talking about.
A And that's what I'm looking at.
Q Thank you. 11:49AM

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one of two duplicate goose samples had a detect for the biomarker?

A Yes.

Q Okay, and do you recall that was the only detection for a non-target species with the biomarker? 01:28PM

MR. TODD: Object to form.

A I don't remember that but --

Q Okay. Do you know whether or not that detection was by nested or qPCR? 01:29PM

A I don't remember.

Q So you don't know whether that detection was by the most sensitive method or not?

A I don't know.

Q Before lunch, a little before lunch, I asked you to do a calculation for me. 01:29PM

A Yes, sir.

Q Did you have an opportunity to do that?

A I did.

Q Could you provide me your results? 01:29PM

A Sure, but let me repeat what it was that I thought I was calculating just so we're talking about the same thing.

Q That would be helpful. Thank you.

A Okay. As I understood it, what you were 01:29PM

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asking me was if I had a sample of size ten and in the hypothetical we were discussing all ten of those samples showed the biomarker, what was the probability -- could I state what the lower bound of the probability was that the biomarker was in whatever the target population is?

Q Yes, sir.

A Is that reasonable?

Q Yes.

A And the answer is, the number could be anywhere between 63 percent and 100 percent. 01:30PM

Q Okay. Thank you for doing that calculation on your lunch hour.

A Sure.

Q Do you have an opinion, Dr. Cowan, as to how the use of a composite sample would influence or -- let me see if I can say -- withdraw that. Let me ask it this way: How would using a composite sample when the sample is collected with the objective of proving that the potential biomarker was not present in that composite species of manure affect the interpretation of the data? 01:30PM 01:31PM

A This is what we were discussing before in terms of clustering. What's happened is that we have taken a sample however -- just for the sake of 01:31PM

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